

SYSTEMATICS & COLLECTIONS

Preserving Diversity, Trade, and Our Way of Life

In a government facility not too far from you, there is a carefully preserved collection that contains thousands of items. Dead or alive, the items in this collection influence your life in significant and surprising ways.

It may sound like the premise of a summer blockbuster, but it is a real scenario that occurs in federal buildings throughout the United States. The Agricultural Research Service (ARS) maintains hundreds of diverse collections of microbes and viruses, invertebrates and cell cultures, seeds and trees, and everything in-between. And every collection has major benefits for agricultural science.

Collections can be used to protect the genetic diversity of important species, to support regulation and policy decisions, and to preserve history. Some ARS collections include specimens for research, conservation, and food safety. Some preserve specimens to serve as standards or for reference purposes. Others include materials gathered for documenting diversity in nature.

Some collections house rare and historic specimens, such as the National Clonal Germplasm Repository in Corvallis, Oregon, which includes a descendant of the oldest living pear tree in the United States, or the National Animal Germplasm Program, in Fort Collins, Colorado, which maintains blood and semen samples from rare sheep breeds popular in the colonial era.

At the National Center for Genetic Resources Preservation (NCGRP) at Fort Collins, scientists maintain more than 1 million samples of genetic material from plants, animals, insects, and microbes. The materials have been used to develop new products and improve specific traits in agricultural crops. In addition, NCGRP researchers have pioneered new methods and technology for long-term preservation of genetic materials.

These materials provide a link to the past, but they are equally important for the future of food and agricultural security. When new diseases or pests appear, scientists seek out individuals with genetic resistance to these stressors. Repository collections have been used in research to improve the yields, nutritional value, and hardiness of important agricultural crops.

ARS collections have had a major influence on public health as well. In 1942, the healing properties of penicillin had already been demonstrated, but it was impossible to produce enough to treat more than a handful of patients. That changed rapidly, thanks to the culture collection maintained by the ARS National Center for Agricultural Utilization Research, in Peoria, Illinois. The collection included a strain of *Penicillium* that improved the speed of penicillin production. Within 3 years, the amount of available penicillin had increased 25,000 times.

Collections also play an important role in trade. In 1996, for example, wheat farmers in Arizona reported that their fields were infected with Karnal bunt—a fungus that makes wheat

taste like spoiled fish. Similar reports followed from wheat producers around the United States, and other countries began to embargo U.S. wheat. But what looked like a disaster for the multibillion-dollar U.S. wheat industry was forestalled when ARS scientists proved that the Karnal bunt infestation was limited to a small area in Arizona. The other producers were observing a harmless look-alike fungus. The only way to differentiate between the two nearly identical fungi was to conduct DNA tests—developed with samples from USDA’s National Fungus Collection in Beltsville, Maryland.

U.S. importers benefit from national collections as well. There are many subspecies of fruit fly, some of which are more harmful than others. Scientists have used the ARS fruit fly collection to develop a system for port inspectors to rapidly identify fruit flies in produce shipments. This system came into play in December 2001, when inspectors identified larvae from the destructive Mediterranean fruit fly in shipments of clementine oranges from Spain. Thanks to the system, authorities were able to halt imports before U.S. consumers started packing pests into their lunchboxes and holiday spreads along with this popular fruit.

Collections also play an integral role in protecting our nation’s borders. Many of the travelers that cross U.S. borders are too small to see. Insects, fungi, and microorganisms can hitch a ride on the clothes and luggage of people traveling from one country to another. Some of these items, as well as some plants and animals that are transported intentionally, have the potential to wreak havoc in a new environment.

Every year, businesses lose millions of dollars when shipments are delayed at the border—often because inspectors cannot identify some item in the shipment. Scientists use collections of insects and microbes to identify unfamiliar items and determine whether or not they should be admitted to the country. This is a valuable service not only to the businesses that are transporting goods or awaiting shipments, but also to the general public, which relies on the government to ensure food safety.

Collections can also be used to assist foreign countries, as they did when the Iraqi *Rhizobium* collection was destroyed. ARS maintains a collection of these nitrogen-fixing bacteria in Beltsville, and this resource, which has more than 5,000 specimens, was used to help Iraqi scientists rebuild their collection.

These achievements are impressive, but hardly unique. Collections like these play a vital role in national security, public health, environmental monitoring, and scientific discovery every day, everywhere.

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